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10/660,962	09/12/2003	Erin Wanju Liao	Liao 1	6348

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EXAMINER	
JONES, HUGH M	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/660,962	Applicant(s) LIAO, ERIN WANJU	
	Examiner Hugh Jones	Art Unit 2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 February 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. Claims 10-24 of U. S. Application 10/660,962, filed 9/12/2003, are pending.

Claim Objections

2. Claim 14 is objected to because of the following informalities: "at at" is recited in the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 10-24 are rejected under 35 U.S.C. 101 as being directed to nonstatutory subject matter since the claims as a whole do not provide for a practical application, as evidenced by lack of physical transformation or a useful, tangible, and concrete result:

5. The claims as a whole do not provide for a physical transformation or a tangible and specific and substantial result:

- claims 10-18 do not provide for a tangible and useful (specific and substantial) result;
- claims 19-24: The claims as a whole are directed to software per se;
- claims 19-24: the computer readable medium is not defined in the specification and may encompass nonstatutory features.

6. It is noted that no hardware or medium related to implementation of the invention has been disclosed in the specification.

7. The only disclosure relating to preventative measures is in paragraph 2 of the specification (background of the invention).

page 1:

> Service providers typically want to calculate the user traffic handling capacity of the network and also monitor the network during its operation to detect when the network is operating near its calculated capacity. In this manner, a service provider is able to take preventive measures to prevent the communication network from being overloaded.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

9. A person shall be entitled to a patent unless –

> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

10. Claims 10-24 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by Nousiainen et al..

11. Nousiainen et al. discloses :

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     determining a capacity of a node based on a traffic model
comprising at least one relationship between at least one application
type and at least one rate of information being conveyed through the
node and taking at least one preventive measure responsive to the
determined capacity indicating a potential overload condition at the
node.
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[(executive summary [This document addresses **traffic dimensioning, estimation, network planning, traffic patterns, dimensioning rules and guidelines, traffic load scenarios**; UMTS planning example starts with overview and presentation of measured GSM1800 traffic profiles. Requirements for services and QoS levels are given and planning tool parameters, such as those related to multipath environment, Eb/No requirements and max/min powers, listed. The planning example is then carried out and analyzed. For WLAN, key features are used as starting point and then example hotspot scenarios (airport, cafe, etc.) shown and analyzed. **Different user profiles (browsing, ftp, email) are used in each case. Finally, traffic load scenarios are investigated and relevant parameters such as radio resource availability and QoS taken into account. ; In addition to**

explaining the trial environment and the envisaged trial, an investigation about announced UMTS terminals and their properties (e.g. max data rate in uplink/downlink, etc.) is given.];)

page 57: The totally available spectrum determines *the number of operating channels together with the maximum supported data rate (providing the system throughput), which in turn is an important figure of merit for the system capabilitie*s;

2.2.1.5 Mean load per channel determination (specifics below): In order to determine the mean load in a channel (kbps/PDCH), there is necessary count on two factors: • The maximum physical capacity of channel, determined exclusively for the codification scheme and the C/I. • The throughput per channel do not achieve the maximum value due to the competence between several mobiles for the same channel. This factor depend on the traffic load that exist in the cell and the timeslots number which is solicited by mobiles.; **2.2.2.3.1 Traffic Modelling Approaches; 2.2.2.3.2 Traffic Modeling using the Single User Traffic Model:** The single user traffic model utilizes the notion that a user, who runs non real-time applications (e.g. **HTTP, e-mail, etc.**), follows a characteristic usage pattern. Each application is completely described by its statistical properties. These statistical properties comprise of an alternating process of on- and off periods with some application specific length or data volume distribution, respectively. Moreover, within each on-period the packet arrival process is completely captured by the packet interarrival-times and the corresponding packet sizes. Thus, the single user traffic model characterizes the traffic that an individual user generates. In UMTS, we have to distinguish between real-time users and non real-time users. Considering just non real-time users, the single user traffic model is employed on three different levels [17]: (1) The session-level describes the dial-in behaviour of the individual users, characterized by the session interarrival-time distribution and the session data-volume distribution. (2) The connection-level describes for each individual application the corresponding distribution of connection interarrival-times and connection data volume, respectively. (3) The packet-level characterizes the packet interarrival-time distribution and the packet size distribution within the application specific connections. A non real-time user runs applications like **HTTP, e-mail, and various other applications** that can be concurrently enabled. During an on-period, i.e. an application specific connection, the user applies the appropriate application in an active fashion. The interarrival-time between two successive connection starting points of the same application-type and the data volume of each connection are drawn from general distributions, respectively. The packet interarrival-times within each connection and the corresponding packet sizes are also drawn according to an application dependent distribution. The overall traffic stream of a user constitutes of the superposition of the packet arrival process of all application connections within the user's session. ...; **2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters):** In this chapter, a categorization of congestion situations is described, based on parameters that affect load augmentation. All possible combinations of these categories constitute the list of traffic load scenarios that have to be taken into account within the project.; **2.3.2 Resources availability (specifics below);**

2.1.1.3.4 Signalling Capacity: Capacity limiting parts: Interfaces may be divided for radio and fixed connections. The latter is much larger, logically divided for fixed UTRAN part, core network and interfaces connecting them. Fixed interfaces are built using standard technologies, which are well known and used, easily scalable and cheap. When an interface reaches its capacity it can be either replaced with links of higher capacity or a new, parallel link can be added (it usually requires addition of proper interface cards in connected nodes). So interfaces capacity is limited only by capacities of the nodes, which depend on vendors' solutions. Some of the interfaces are only logically distinguishable, because vendors offer equipment, which combine in one physical rack...;

2.1.2.3.3 (Traffic profiles) Traffic modelling and service requirements form a basis for advanced network planning and for evaluating the interaction of coverage and capacity. The more accurate the traffic estimate, the more realistic the results achieved. In the traffic modelling phase traffic forecasts are created in different ways. The busy-hour traffic can be given as input figures, or measured traffic

data from measurement tools can be exploited. For example, knowledge of hot-spot locations in the current network and traffic measurements from these locations is useful.] ,

determining a plurality of relationships for a plurality of different application types at each of a plurality of different information rates
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)**];

determining the traffic model from a combination of the determined relationships
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)**];

determining the capacity of the node based upon a current processor occupancy of at least one processor at the node
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)**];

determining the traffic model from a combination of the determined relationships
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)**];

determining the at least one relationship as a mathematical equation describing a relationship between processor occupancy of at least one processor at the node and the at least one application type at the at least rate of information
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)**];

determining the traffic model from a combination of the determined relationships
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)**];

determining a plurality of mathematical equations each describing a relationship between processor occupancy of at least one processor at the node and at least one application type at least one information rate and determining the traffic model as a linear combination of the determined mathematical equations;
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)**];

determining the traffic model from a combination of the determined relationships
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of**

UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)];

wherein the communication network comprises a wireless communication network.;
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)]**;

determining the traffic model from a combination of the determined relationships
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)]**;

determining a processor occupancy of at least one processor at the node from a traffic model comprising a linear combination of a plurality of mathematical equations, each describing a particular relationship between an information rate of a particular application type and a resulting processor occupancy;
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)]**;

determining the traffic model from a combination of the determined relationships
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)]**;

wherein the at least one processor processes subscriber information;
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)]**;

determining the traffic model from a combination of the determined relationships
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)]**;

determining the capacity of the node by determining a processor occupancy of a processor at the node for an uplink and a downlink of the processor.
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)]**;

determining the traffic model from a combination of the determined relationships
[executive summary ; **2.2.1.5 Mean load per channel determination; 2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process (specifics below); 2.2.2.3.4 Traffic Modelling of UTMS Traffic; 2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters); 2.1.1.3.4 Signalling Capacity: Capacity limiting parts; 2.1.2.3.3 (Traffic profiles)]**;

See:

2.1.1.3.3.12 GPRS capacity and the User Busy-Hour Throughput: The examples above provide figures for overall GPRS throughput, from a per TRX basis through to the whole area. In the first case, the system offers 1734kbps across the area. In a one-hour period, the total available carried load will be 3600 * 1734 kbps = 6242.4Mbps. If this is carried by, say, 10000 users, then each, on average, will account for approximately 624kb. Using the above principle, it is possible to work back from the user busy hour traffic figure to the required number of GPRS timeslots per cell, by reversing the calculation procedure. It should be remembered, though, that the busy hour periods for circuit-switched and GPRS services may not coincide.

2.1.1.3.3.13 Summary of GPRS Traffic Dimensioning: Basic guidelines have been given for dimensioning a mixed circuit-switched and GPRS network. These should be treated as a 'rule of thumb' to enable initial designs to be performed. There remain a number of 'unknowns' in this area, which, when better quantified, will allow for a degree of redimensioning. These are: **Data profiles.** *Currently, it is assumed that the majority of users will be using GPRS for web-browsing and e-mail applications. These imply relatively large message sizes (upwards of several kilobits, typically). The quality of service requirements in these applications may differ somewhat from those associated with other applications, such as those involving short messaging. Should the application profile changed significantly from that assumed in the simulation work performed, then, for example, it may be possible to relax the GPRS loading constraints, allowing for higher channel loading, and higher GPRS throughput*. **Traffic profiles**. While initially it may sometimes be necessary to dimension a network on the assumption that the circuit-switched and GPRS traffic profiles peak simultaneously, due to a lack of information to the contrary, this may actually result in a degree of over-dimensioning in practice. Should data be available that would offer more accurate prediction of how the load levels might change, then these should be used to dimension accordingly. The overall peak hour is then of primary concern, and dimensioning should reflect this. There is the question of how the territory parameters ought to be set, and, in the absence y should be to again consider the overall peak hour.

2.1.2.3.3 (Traffic profiles) ***Traffic modelling and service requirements form a basis for advanced network planning and for evaluating the interaction of coverage and capacity***. The more accurate the traffic estimate, the more realistic the results achieved. In the traffic modelling phase traffic forecasts are created in different ways. The busy-hour traffic can be given as input figures, or measured traffic data from measurement tools can be exploited. For example, knowledge of hot-spot locations in the current network and traffic measurements from these locations is useful.

2.2.1.5 Mean load per channel determination: In order to determine the mean load in a channel (kbps/PDCH), there is necessary count on two factors: • The maximum ***physical capacity of channel***, determined exclusively for the codification scheme and the C/I. • The throughput per channel do not achieve the maximum value due to the competence between several mobiles for the same channel. This factor depend on the traffic load that exist in the cell and the timeslots number which is solicited by mobiles.

2.2.2.3.1 Traffic Modelling Approaches; 2.2.2.3.2 Traffic Modeling using the Single User Traffic Model: The single user traffic model utilizes the notion that a user, who runs non real-time applications (e.g. ***HTTP, e-mail, etc.***), follows a characteristic usage pattern. Each application is completely described by its statistical properties. These statistical properties comprise of an alternating process of on- and off periods with some application specific length or data volume distribution, respectively. Moreover, within each on-period the packet arrival process is completely captured by the packet interarrival-times and the corresponding packet sizes. Thus, the single user traffic model characterizes the traffic that an individual user generates. In UMTS, we have to distinguish between real-time users and non real-time

users. Considering just non real-time users, the single user traffic model is employed on three different levels [17]: (1) The session-level describes the dial-in behaviour of the individual users, characterized by the session interarrival-time distribution and the session data-volume distribution. (2) The connection-level describes for each individual application the corresponding distribution of connection interarrival-times and connection data volume, respectively. (3) The packet-level characterizes the packet interarrival-time distribution and the packet size distribution within the application specific connections. A non real-time user runs applications like ***HTTP, e-mail, and various other applications*** that can be concurrently enabled. During an on-period, i.e. an application specific connection, the user applies the appropriate application in an active fashion. The interarrival-time between two successive connection starting points of the same application-type and the data volume of each connection are drawn from general distributions, respectively. The packet interarrival-times within each connection and the corresponding packet sizes are also drawn according to an application dependent distribution. The overall traffic stream of a user constitutes of the superposition of the packet arrival process of all application connections within the user's session. New users enter the considered system environment according to a session interarrival-time distribution and leave the system after transferring a specific data-volume drawn according to a session volume distribution. While this modeling approach is efficient and authentic towards simulation studies, the nature of the generally distributed sources of the single user traffic model does not result in an analytically tractable model that can be integrated as a traffic generating component within analytical models. This motivates a different modelling approach using a stochastic process that matches the crucial properties of the considered IP traffic.; **2.2.2.3.3 Traffic Modeling using the Batch Markovian Arrival Process** The batch Markovian arrival process (BMAP) belongs to the class of Markov renewal processes and is analytically tractable. If we consider a continuous-time Markov chain with (N+1) states {0,1,...,N} where the states {1,2,...,N} are transient states and 0 is the absorbing state. Based on this governing, the BMAP can be constructed as follows: assume the BMAP is in a transient state *i* for an exponentially distributed time with rate λi . When the sojourn time has elapsed, there are (M+a) possible cases for state transitions. With probability (P*m)i,j* the BMAP enters the absorbing state 0 and an arrival of batch size *m* occurs. Then, the process is instantaneously restarted in state *j*. Note that the selection of state *j* (1 ≤ j ≤N) and batch size *m* (1 ≤ m ≤M) is uniquely determined by (P*m)i,j*. On the other hand, with probability (Po*)i,j*, the BMAP enters another transient state j,j ≠ i, z , without arrivals. Furthermore, we can define (Do*)i,j* = λi*(*Po*)i,j* for j ≠ i, (Do*)i,I* = -λ i *and* (Dm*)i,j* = λi*(*Pm*)i,j*.; **2.2.2.3.4 Traffic Modelling of UTMS Traffic**

2.3 Traffic load scenarios; 2.3.1 The concept (needs and parameters): In this chapter, a categorization of congestion situations is described, based on parameters that affect load augmentation. All possible combinations of these categories constitute the list of traffic load scenarios that have to be taken into account within the project.

2.3.2 Resources *availability*: The resources' restriction of each network is one of the main constraints causing a congestion situation, especially because of the unceasing emergence of new services, which demand more resources. GPRS is built on top of GSM and allows traffic to be sent and received at a speed of approximately 170 Kbps. On the other hand, UMTS and WLAN allow faster speeds, and can achieve data throughput of 2 Mbps and 10 Mbps respectively. This is a whole lot faster than the GSM possibilities. Packet switching allows radio resources to be used only when users are actually sending or receiving data. Rather than dedicating a radio channel to a mobile data user for a fixed period of time, the available radio resource can be concurrently shared between several users. This efficient use of scarce radio resources means that large numbers of users can potentially share the same bandwidth and be served from a single cell/action point. But even in this case, we cannot avoid congestion situations in signaling or data overload occasions. For example, a user may request, via the Packet Random Access Channel (PRACH), one or more Packet Data Traffic Channel (PDTCH), but due to the lack of resources, no dedicated channels are available. In worse situations the user cannot even access a PRACH in order to request a PDTCH. *The bandwidth of the wireless link is precious, as it is a limited resource. Bad bandwidth allocation and management, the support of high bit rates, variable bit rates to offer bandwidth on demand, etc can also lead on overload situation and congestion; thus it is another parameter that must be always taken into account for traffic load scenarios. Power setting and control, is also a concern (in case of UMTS), in particular on the uplink.* Without tight and fast power control a whole cell can be blocked from a single overpowered mobile terminal. When two mobile terminals operate within

the same frequency and are only separable at the Base Station (BS) by their respective spreading codes, but one of them is, for example, at the cell edge (and suffers a path loss) in comparison with the other one, which is close the BS, it is easily the near to the BS terminal to over shout the other one. This is the well-known near-far problem, which BS overcomes by requesting increasing/lowering the power of mobile terminals in order to keep the received power levels equal. Thus, it is obvious that power control is needed to keep the interference levels at minimum in the air interface [29]. Consequently, radio resources in wireless networks may refer in general to channels (carriers, slots, codes, mixed slots/codes), power and bandwidth. According to each network peculiarities, **levels of resources' utilization have to be specified (in specifications' deliverable), based on real time measurements of network resources, in order to provide in a gradated and measurable manner the way that resources are utilized**.

2.1.1.3.4 Signalling Capacity: The negotiation between the terminal and the base station has to be considered to understand the extra load placed on the existing GSM signalling channels. **Data Transfer:** In the downlink direction, the base stations uses the PCH and AGCH for call assignment, with the PCH used for the paging of a terminal, and the AGCH providing the information of assigned traffic channel to the terminal. In the uplink direction, a terminal sends information to the Base Station by using just one broadcasting channel, which is called RACH. On this channel, the mobile sends a request for service to the Base Station (or to the Network) in both mobile originating and mobile terminating cases. **Packet Data Transfer: Down Link and Uplink initiated: Both uplink and downlink initiated data transfer will require extensive use of the RACH and AGCH. The load on these channels will be highly dependent on the traffic model**. In addition to the *packet data traffic*, mobility management procedures such as routing area updates and cell re-selections as well as GPRS attach and detach generate common control signalling. The parameters associated with the above events (ready timers, periodic RA updates) and the implementation of the network (Microcells/Macrocells/RA size) will have a significant impact on the CCCH load.

2.1.1.3.4 Signalling Capacity:

Capacity limiting parts: Interfaces may be divided for radio and fixed connections. The latter is much larger, logically divided for fixed UTRAN part, core network and interfaces connecting them. Fixed interfaces are built using standard technologies, which are well known and used, easily scalable and cheap. When an interface reaches its capacity it can be either replaced with links of higher capacity or a new, parallel link can be added (it usually requires addition of proper interface cards in connected nodes). ***So interfaces capacity is limited only by capacities of the nodes, which depend on vendors' solutions***. Some of the interfaces are only logically distinguishable, because vendors offer equipment, which combine in one physical rack, several logical elements (e.g. Combined GSN — CGSN — which is mixture of SGSN and GGSN). **Capacity of such an invisible interface is limited only by combined node capacity** (what, again, depends on vendor's solution). In case of radio interface the situations is completely different. It is standardized very precisely and the standard introduces constraints limiting interface capacity. Vendors can just try to implement mechanisms allowing better utilization of available capacity, but the technology is new and has not been tested commercially yet. On the other hand, most of the traffic transmitted in UMTS network (both, user data and signalling) goes through air, so the interface is heavily loaded. Therefore, *Uu* is very important interface on one hand, but on the other, its practical performance is unknown. The only known thing is that its capacity is limited.

2.1.2.2.9 Air Interface Capacity analysis: CDMA radio network capacity is often described as soft. Number of scrambling codes limits the number of simultaneous calls in uplink, but it is rather theoretical constraint. That means that there is no strict limit for number of users, which can be served in a cell. The only limit is service quality and system stability (since admitting too many users can lead to coverage waving) [12]. *Thus, UMTS capacity means the capacity of the cell or network, when QoS level is still acceptable. In this chapter some analysis concerning the capacity is presented. Capacity depends on many factors*. Some of them are presented. Noise, that limits uplink, does not increase linearly with increasing number of users. After crossing a certain limit (6 dB in the simulation) it starts to increase much faster and

levels again when most mobile stations reach their maximum output power. With rapid noise rise, fraction of good uplink connections decreases. Cell size limits the capacity, too. Increasing average cell diameter (inter–base station distance) causes decreasing the number of good uplink connections. The same happens to downlink, but much slower. The noise is higher and higher, when cell diameter increases, but only until most mobile stations reach their maximum transmitter power — afterwards its characteristic is almost flat. Propagation loss exponent also limits the capacity. It directly defines maximum reasonable cell size: the stronger signals are reduced with the distance, the smaller cell can be. Active set size (soft handover) does not influence cell capacity when traffic load is relatively low. However large active set helps maintain high fraction of satisfied users when traffic load increases. The only exception is active set limited to one base station (hard handover); even when traffic load is low the number of satisfied users is smaller than in the case of bigger active set. The environment (indoor or outdoor) does not change gained characteristics. As it has already been mentioned, the capacity is defined by QoS level. One of QoS factors is SIR. Influence of Doppler bandwidth .The more frequent Doppler fades are, the higher standard deviation of SIR level of users suffering the worst radio conditions is. Different services require different bandwidths and generate different types of interference. Simulations show that the only way to maintain service QoS in a cell is to implement constraints for capacity. **Results of different scenarios (street / office, data / speech, pedestrian / vehicular) allow predicting that data services will be the most responsible for noise rise and therefore, for uplink capacity limits**. Most of the simulations show that the capacity of uplink connection is more limited than of downlink. However, ***downlink capacity may not be skipped during capacity analysis, because the most popular data services (like web browsing or file downloading) are very asymmetric: bandwidth demands for downlink are much higher than for uplink***.

Page 57: In the key features, performance capabilities and limitations of the major WLAN standards (IEEE 802.11 family, ETSI BRAN HiperLAN type 2, and HomeRF) are summarized. Basically, these WLAN systems operate either in the 2.4 GHz Industrial, Scientific, and Medical (IEEE 802.11 and HomeRF) band. Regional differences apply for the totally available spectrum. In Europe and in North America 83 MHz are available in the 2.4 GHz band. In the 5 GHz bands, in Europe the operation of HiperLAN/2 systems is foreseen in license exempt bands with a total bandwidth of 455 MHz, whereas in the US only 300 MHz are available in the unlicensed UNII bands for operation of IEEE 802.11acompliant systems. The totally available spectrum determines the number of operating channels together with the maximum supported data rate (providing the system throughput), which in turn is an important figure of merit for the system capabilities.

2.2 Description of traffic dimensioning models

2.2.1 Traffic Dimensioning Models in GPRS

The success of GSM (Global System for Mobile Communications) cellular mobile telephony has gone beyond the imagination of the most optimistic forecasters who predicted its penetration in the early 1990s. In parallel, the continued growth of information transfer via the Internet will increase the demand for wireless data communication. It is predicted that in the mobile cellular industry the percentage of data users will be comparable with voice users by year 2005.

The GSM standard offers circuit switched data transfer modes up to 14.4 Kbps on a single time-slot. The drawback with using circuit switched data transfer is that it does not use the radio resource efficiently. This is because the radio resource is allocated to the user for the duration of their session; where each session may consist of a number of packet data transfers that are separated in time. The result is that the user is billed for the duration of the call rather than the amount of data transferred and the operator looses system capacity.

3 CAUTION++ SYSTEM EVALUATION

3.1 General about available trials

The main goal of the CAUTION ++ project is to design and develop a novel, low cost, flexible, highly efficient and scaleable system able to monitor all available resources form a set of wireless system, namely GSM, GPRS, UMTS, WLAN, and perform a hierarchical management of them in order to increase the whole network performance. In addition location and mobility management information is also considered. Then, to achieve such ambitious objective a set of field trials have been envisaged.

2.1.2.3.3 Traffic profiles

Traffic modelling and service requirements form a basis for advanced network planning and for evaluating the interaction of coverage and capacity. The more accurate the traffic estimate, the more realistic the results achieved. In the traffic modelling phase traffic forecasts are created in different ways. The busy-hour traffic can be given as input figures, or measured traffic data from measurement tools can be exploited. For example, knowledge of hot-spot locations in the current network and traffic measurements from these locations is useful. Therefore, our RNP tool has to import traffic from second generation network measurements, since hot-spots are often located in the same area independently of radio access technology or method. Thus, traffic data and four traffic profiles are generated from the existing GSM 1800 network and are presented below.

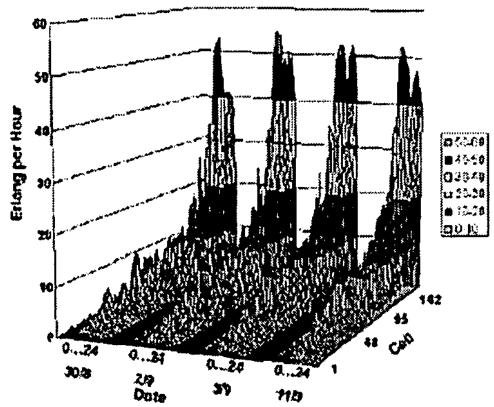

Figure 25: Hourly traffic data of GSM cell

As we can observe from the upper Figure 25, the distribution of traffic for the days of interest over the existing cells for each hour of the day is our case study. The first observation that we could make is that the traffic distribution does not vary significantly, as far as the four different days are concerned. In other words the four different profiles seem roughly identical. However, if we take a closer look we can distinguish some differentiating points which are presented below.

While it is clear that for the first 130 cells the traffic is common for all four days and lies below 20 Erlang per hour, we can see that cell 125 or 128 presents a peak of 26 Erlangs per hour at about 2 o'clock in the afternoon for 30/8, 2/9 and 3/9, which is surprisingly absent on the 11/9.This cell could be situated in an office area which on that day was on a day off or was closed due to technical reasons. We can also observe that the remaining 10 cells present a peak at 53-65 Erlangs, which is uniformly observed for all four days of interest the main observation of Figure 26, could be that the traffic is distributed in the same fashion for all four days.

Response to Arguments

12. Applicant's arguments, filed 2/8/2007, have been carefully considered, but are not persuasive. Applicants are thanked for the amendment.

13. Applicants are thanked for the oath and the objection is withdrawn.

14. Applicant's reliance upon the State Street ruling in their arguments against the 101 rejections is not persuasive. Claim 10 recites:

> A method of *evaluating a node* of a communication network, comprising the steps of:
>
> determining a capacity of the node *based on a traffic model* comprising at least one relationship between at least one application type and at least one rate of information being conveyed through the node, and

> taking at least one preventive measure responsive to the determined capacity indicating a potential overload condition at the node.

15. The node is not actually claimed (as hardware or otherwise). The data may be historical or hypothetical. The claim only recites determining a capacity of the node based upon a software model.

16. The unspecified preventive action is not (as claimed) a transformation of matter and does not provide for a specific and substantial result. The claim does not require that the unspecified action be related to an actual node. Regardless, the concrete, tangible result has to do with the "evaluation of a node", as directed by the preamble. The determined capacity has not been stored or otherwise made available.

17. No concrete, useful and tangible result has been claimed. Furthermore, no hardware or medium related to implementation of the invention has been claimed or disclosed in the specification.

18. As stated in State Street (emphasis added):

> For purpose of our analysis, as noted above, claim 1 is directed to *a machine programmed with the Hub and Spoke software* and admittedly produces a "useful, concrete, and tangible result." Alappat, 33 F.3d at 1544, 31 USPQ2d at 1557. This renders it statutory subject matter, even if the useful result is expressed in numbers, such as price, profit, percentage, cost, or loss.
>
> ...
>
> Today, we hold that the transformation of data, representing discrete dollar amounts, *by a machine through* a series of mathematical calculations into a final share price, constitutes a

> practical application of a mathematical algorithm, formula, or calculation, because it produces "a useful, concrete and tangible result"-a final share price _momentarily fixed for recording and reporting purposes_ and even accepted and relied upon by regulatory authorities and in subsequent trades.

19. The Gao et al. (5,548,533) in view of Hanes et al. (5,440,719) is withdrawn because it is cumulative to the new 102 rejection applied against the new claims.

20. Applicant's arguments against the art rejections are not persuasive. Applicant's arguments are based upon speculation (that there is no benefit) and do not address the merits of the rejection. Applicants have provided no legal justification for their position.

21. Applicant's arguments also appear to be piecemeal. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

22. Applicants have not attempted to argue whether the claims are novel and nonobvious over the applied references and instead only speculate that the references cannot be combined. Regardless, the rejected claims were canceled.

> Applicant respectfully traverses the rejection under 35 U.S.C. §103 based upon the proposed combination of the *Gao* and *Hanes* references. The proposed combination cannot be made. Where a proposed combination provides no benefit in the context of the primary reference, the combination cannot be made and there is no *prima facie* case of obviousness.

> There would be no benefit to adding information regarding different types of applications from the *Hanes* reference to the arrangement of the *Gao* reference. The *Gao* reference only
>
> the *Gao* reference. In other words, adding additional information from the *Hanes* reference to the *Gao* reference will not facilitate anything in the context of the *Gao* reference. Therefore, the proposed combination does not provide any benefit and the proposed combination cannot be made. There is no *prima facie* case of obviousness.

Furthermore, Applicants have not discussed the new claims and whether Applicants believe them to be novel with respect to the art.

23. Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

24. Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

Conclusion

25. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

26. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is

filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

27. Any inquiry concerning this communication or earlier communications from the examiner should be:

directed to: Dr. Hugh Jones telephone number (571) 272-3781,

Monday-Thursday 0830 to 0700 ET,

or

the examiner's supervisor, Kamini Shah, telephone number (571) 272-2279.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist, telephone number (703) 305-3900.

mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 308-9051 (for formal communications intended for entry)

or (703) 308-1396 (for informal or draft communications, please label *PROPOSED* or *DRAFT*).

Dr. Hugh Jones

Primary Patent Examiner

April 19, 2007